

What is claimed is:

1. A manufacturing method of an optical fiber having one or more holes extending along the axis, comprising:

a first process for forming holes in a preform;

5 a second process for heating the preform and drying the inside of the holes; and

a third process for drawing the preform into an optical fiber.

2. A manufacturing method of an optical fiber according to claim 1, wherein:

10 at least a part of the holes are through-holes; and

the second process is performed while a dry gas is flowed through the through-holes.

3. A manufacturing method of an optical fiber according to claim 1, wherein:

15 at least a part of the holes have a closed end; and

the second process is performed while the holes having a closed end are filled with a dry gas.

4. A manufacturing method of an optical fiber according to claim 3, wherein:

20 the process for filling a dry gas into the holes having a closed end and the process for discharging the dry gas from the holes having a closed end are repeated alternately in the second process.

5. A manufacturing method of an optical fiber according to claim 1,

wherein:

at least a part of the holes have a closed end; and

the second process is performed while the inside of the one or more holes having a closed end is subjected to reduced pressure for evacuation.

5 6. A manufacturing method of an optical fiber according to claim 1,
wherein:

the preform is heated at a temperature equal to or higher than 800 °C in the second process.

7. A manufacturing method of an optical fiber according to claim 2 or 3,
10 wherein:

the dew point of the dry gas is -50 °C or lower.

8. A manufacturing method of an optical fiber according to claim 7,
wherein:

the dry gas includes an inert gas equal to or more than 85 % by molar
15 fraction.

9. A manufacturing method of an optical fiber according to claim 8,
wherein:

the inert gas is selected from a group consisting of N₂, He, and Ar.

10. A manufacturing method of an optical fiber according to claim 7,
20 wherein:

the dry gas includes an active gas which has dehydration effect.

11. A manufacturing method of an optical fiber according to claim 10,
wherein:

the active gas having dehydration effect includes at least one of HF, F₂, Cl₂, and CO.

12. A manufacturing method of an optical fiber according to claim 1, wherein:

5 the inner wall surfaces of the holes of the preform are smoothed prior to the second process.

13. A manufacturing method of an optical fiber according to claim 1, wherein:

10 the inner wall surfaces of the holes of the preform are subjected to dry etching prior to the second process.

14. A manufacturing method of an optical fiber according to claim 1, wherein:

the pressure in the holes is adjusted during to the third process.

15 15. A manufacturing method of an optical fiber according to claim 1, wherein:

the preform having the holes is formed from a columnar glass rod, using a perforation tool in the first process.

16. A manufacturing method of an optical fiber according to claim 1, wherein:

20 a plurality of capillary tubes are assembled to form a bundle and the bundle is inserted into a jacketing pipe to form the preform having the holes in the first process.

17. An optical fiber having a core and a cladding, the cladding

surrounding the core, and either or both of the core and the cladding being provided with one or more holes extending along the axis;

the optical fiber allowing light to propagate in an axial direction by confining the light in the core the total reflection or Bragg reflection at a transmission loss of 200 dB/km or less at the 1380 nm wavelength.

18. An optical fiber according to claim 17, wherein:

the density of water inside the holes is 1 mg / liter or less.

19. An optical fiber according to claim 17, wherein:

the transmission loss at the wavelength of 1380 nm is 30 dB/km or less.

20. An optical fiber having a core and a cladding, the cladding surrounding the core, and either or both of the core and the cladding being provided with one or more holes extending along the axis;

the optical fiber allowing light to propagate in an axial direction by confining the light in the core by total reflection or Bragg reflection at a transmission loss of 10 dB/km or less at the 1550 nm wavelength.

21. An optical fiber according to claim 20, wherein:

the transmission loss at the wavelength of 1550 nm is 3 dB/km or less.

22. An optical fiber according to claim 21, wherein:

the transmission loss at the wavelength of 1550 nm is 1 dB/km or less.

23 An optical transmission system including at least one optical fiber having a core and a cladding, the cladding surrounding the core, and either or both of the core and the cladding being provided with one or more holes extending along the axis;

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100
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